

## Insufficiency of the Contact

Theory 289

electrolyte must be considered apart, the nitric acid by itself, and the muriatic acid by itself, for that one may differ from another in the *direction* of the change induced by dilution, then how can the following results with a single acid be accounted for?

974. I prepared four nitric acids:

A was very strong pure nitric acid ;  
B was one volume of A and one volume of water;  
C was one volume of A and three volumes of water;  
D was one volume of A and twenty volumes of water.

Experimenting with these acids and a metal, I found that copper in C acid was positive to copper in A or D acid. Nor was it *the first* addition of water to the strong acid that brought about this curious relation, for copper in the B acid was positive to copper in the strong acid A, but negative to the copper in the weak acid D: the negative effect of the stronger nitric acid with this metal does not therefore depend upon a very high degree of concentration.

975. Lead presents the same beautiful phenomena. In the C acid it is positive to lead either in A or D acid: in B acid it is positive to lead in the strongest, and negative to lead in the weakest acid.

976. I prepared also three sulphuric acids:

E was strong oil of vitriol;  
F one volume of E and two volumes of water;  
G one volume of E and twenty volumes of water.

Lead in F was well *negative* to lead either in E or G. Copper in F was also negative to copper in E or G, but in a smaller degree. So here are two cases in which metals in an acid of a certain strength are *negative* to the same metals in the same acid, either stronger or weaker. I used platinum wires ultimately in all these cases with the same acids to check the interference of the combination of acid and water (961); but the results were then almost nothing, and showed that the phenomena could not be so accounted for.

977. To render this complexity for the contact theory still more complicated, we have further variations, in which, with the same acid strong and, diluted, some metals are positive in the strong acid and others in the

weak. Thus, tin in the  
strongest sulphuric acid E (976) was  
positive to tin in the  
moderate or weak acids F and G; and tin  
in the moderate acid  
F was positive to the same metal in G.  
Iron, on the contrary^

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